# **Fact Sheet**

## DREDGING TO REMEDIATE WHITE PHOSPHORUS CONTAMINATION IN PONDS

### **PROBLEM**

Extensive research conducted by CRREL and other agencies indicates that the cause of massive waterfowl deaths at Eagle Rivers Flats on Fort Richardson, Alaska, is ingestion of white phosphorus particles. The white phosphorus originated from detonated smoke rounds used during military training exercises conducted on the Flats. Although the majority of the white phosphorus particles oxidized before they landed, burning particles that landed in ponded areas were extinguished and sank to the bottom of the water. These particles continue to persist in the cool, wet sediments found in permanently ponded areas. Dabbling ducks and swans ingest the white phosphorus when feeding on the pond bottoms. The problem is to remove the white phosphorus with minimal disruption to the feeding grounds on this natural flyway, and is complicated by the potential presence of large quantities of unexploded ordnance and the frequent occurrence of flooding tides.

### **SOLUTION**

CRREL research indicates that by reducing the water content of the pond sediments below about 30 to 40% by volume and exposing these sediments to air, the white phosphorus should oxidize naturally. CRREL, funded by the Environmental Resources Division of the DPW, Fort Richardson, Alaska, has developed an electro-hydraulic, remote-controlled dredging system to dredge in shallow ponds. The dredge incorporates an auger-type head and is propelled by a hydraulic capstan. The capstan engages a cable strung between deadmen placed by helicopter and anchored in selected locations around the ponds. The dredge operator sits in an armored control cab on shore near the dredging site. TV cameras mounted on the dredge provide a general visual indication of operations, and a heads-up display of dredge mechanical functions is superimposed on the TV monitor to provide additional operator information. The inlet to the dredge pump includes a CRREL-designed trash rack to prevent ingestion of unexploded ordnance, and a revolving knife sweeps by the front surface of the trash rack to clear vegetation and other debris. Dredge spoils are pumped through flexible hose over water and rigid plastic piping over land to the spoils retention basin, which is constructed to allow controlled dewatering of the dredged material. The remediation concept is to dry the solid dredged material in the basin and allow the white phosphorus to sublimate and oxidize naturally.

### **STATUS**

A demonstration project was conducted during the summer of 1995, and the dredging system was modified for the environmental and ordnance-related parameters of Eagle River Flats. In 1996, the system was turned over to a private contractor, and dredging operations continued throughout the summer. The area dredged, once one of the deadliest areas at Eagle River Flats, is now safe for waterfowl. The use of the dredge system in other areas of the Flats is currently being assessed as part of the Superfund Site removal action plan.

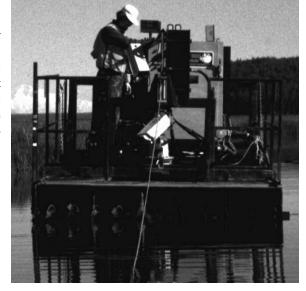
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